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FROM THE  
MISSOURI DEPARTMENT  
OF CONSERVATION  
FOREST HEALTH LAB

# MISSOURI Forest Health UPDATE



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## Emerald Ash Borer

As we move into another growing season, it is helpful to review signs and symptoms that indicate emerald ash borer (EAB) infestations. Refer to: [www.eab.missouri.edu](http://www.eab.missouri.edu). Updated FAQ publications have also been posted there.

The annual statewide survey to detect EAB infestations is well under way. Two areas of EAB infestation are currently known in Missouri: in the Kansas City area and southeastern Missouri. Crews from the Missouri Dept. of Agriculture and U.S. Dept. of Agriculture (APHIS PPQ) have been out for several weeks placing 2-foot tall purple EAB traps in ash trees. A total of 579 traps had been placed in southern and central Missouri as of May 11, 2013. Trap placement continues in central and northern Missouri.

Emergence of emerald ash borer adults is delayed this year along with spring's slow warm-up. Emergence starts near the end of blooming on Van Houtte Spirea and near the start of black locust bloom. In counties where EAB has been detected in southeast Missouri, adult emergence could start sometime during May 5-18. In the Kansas City area, emergence could start sometime during May 12-25. After emergence begins, EAB adults will be present through July. When suspect EAB adults are found, compare them first with other green "look-alike" insects here: [www.eab.missouri.edu](http://www.eab.missouri.edu).

Recent drought conditions will have impacts on EAB detection. We are likely to see more rapid increases in existing EAB populations. Drought-stressed ash trees

are more attractive to EABs and even less able to resist attack than otherwise. Undetected EAB infestations may become more obvious. However, at the same time, drought stress will increase all the ongoing problems we already have with native ash borers and ash decline syndrome, thus making it more difficult to separate native problems from EAB infestations.

Suspected EAB infestations may be reported by phone 866-716-9974 (toll-free), online ([www.eab.missouri.edu](http://www.eab.missouri.edu)) or by contacting your local MDC forester (Local contact at [www.mdc.mo.gov](http://www.mdc.mo.gov)). When reporting, it is helpful to provide photos of 1) the whole tree, 2) the leaves, and 3) close-ups of damage or insects with a coin or other object in view for size reference.

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**Emerald ash borer trap**



**“The use of insecticides should only be considered for trees that are within 15 miles of a known EAB infestation or within an EAB-quarantined county.”**

## Emerald Ash Borer *continued*

Communities and homeowners across Missouri should be planning how to manage their ash trees for the future. Trees in poor condition could be removed now, but should be carefully examined for EAB during removal. Conserving ash trees with insecticides is appropriate in some cases, although it must be understood to be a long-term commitment with applications at 1 to 2-year intervals. The use of insecticides should only be considered for trees that are within 15 miles of a known EAB infestation or within an EAB-quarantined

county. If you are near an EAB infestation, these guides are helpful in making decisions about managing ash trees:

- [http://extension.entm.purdue.edu/EAB/pdf/NABB\\_DecisionGuide.pdf](http://extension.entm.purdue.edu/EAB/pdf/NABB_DecisionGuide.pdf)
- <http://www.mda.state.mn.us/plants/pestmanagement/~media/Files/plants/eab/eabtreatmentguide2.ashx>

## Thousand Cankers Disease of Walnut

Thousand cankers disease (TCD) has not been detected in Missouri, but remains a concern for the economically and ecologically important black walnut resource in the state. The walnut twig beetle (WTB), which spreads TCD, could be moved on infected walnut materials from North Carolina, Pennsylvania, Tennessee, Virginia and western states where TCD has been detected. Visual surveys at high-risk locations for TCD were conducted in 2011 and 2012 by the Missouri Department of Conservation and the Missouri Department of Agriculture. In 2012, a pheromone baited trap for WTB was trialed at several locations by both agencies. The traps have been effective in detecting WTB in other states, however usage is limited by trap expense and limited sensitivity to low level infestations of WTB.

This year, both agencies will increase utilization of WTB traps and continue visual surveys at high-risk locations. We encourage you to become familiar with the symptoms of TCD and to examine declining walnut trees, particularly during tree harvests or removals. Report suspicious trees by contacting your local forester or by filling out an online reporting form at:

<http://extension.missouri.edu/scripts/eab/eabreport.asp>

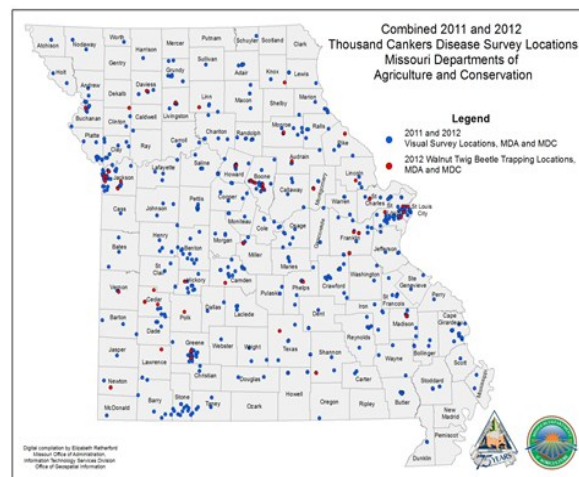
Additional information on TCD can be found at:

[www.mdc.mo.gov/thousand-cankers](http://www.mdc.mo.gov/thousand-cankers)  
<http://thousandcankers.com/>



Hanging a walnut twig beetle trap.

**Dead branches in the upper crown are typical of TCD infection in the East.**





# Slow Spring, Wet Spring

The old cliché is true again: what a difference a year makes. Based on the timing of budbreak and flowering of many plants we monitor in the Columbia area, plant phenology has been running about two weeks later than average as of the first week of May. That is equivalent to about five weeks later than phenology timing

during the very early spring of 2012.

Precipitation has been above normal over most of Missouri so far in 2013. Statewide, the start of the year was the 7<sup>th</sup> wettest January through April on record according to Pat Guinan, State Climatologist (<http://climate.missouri.edu/>).

The U.S. Drought Monitor (<http://droughtmonitor.unl.edu/>) indicates that drought conditions have disappeared over most of the state, except for moderate drought conditions existing in northwestern Missouri.

## Impacts of Cool, Wet Spring Weather on Plant Diseases

We are getting reports of cedar rusts and anthracnose on a variety of species. Cedar rust diseases cause orange lesions on apple, hawthorn, pear, and related species. Anthracnose appears as dark blotchy lesions on a variety of shade tree leaves. Some species will drop a lot of leaves due to anthracnose infection.

Extended periods of cool, wet spring weather are ideal for foliar disease development on susceptible species. Despite the dramatic appearance of some of these diseases, they usually won't kill the tree. By the time you notice the symptoms, it is usually too late to treat the trees. Fungicide treatment in early spring is usually only beneficial to the most susceptible varieties, during tree establishment, or in the most highly visible

locations. Treatments must be applied before infection occurs to be effective.

For more information on cedar rusts see:

- <http://www.hfr.ksu.edu/doc1603.ashx>
- [http://www.ct.gov/caes/lib/caes/documents/publications/fact\\_sheets/plant\\_pathology\\_and\\_ecology/gymnosporangium\\_rusts\\_10-19-10.pdf](http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/gymnosporangium_rusts_10-19-10.pdf)

For more information on anthracnose see:

- [http://www.extension.purdue.edu/extmedia/BP/BP\\_9\\_W.pdf](http://www.extension.purdue.edu/extmedia/BP/BP_9_W.pdf)

**Excessively wet soils** this spring may favor root diseases or cause

root death due to lack of oxygen for sensitive tree species. When drought occurs, affected trees may be less tolerant of the dry conditions. Planting trees in the right location and watering high value trees appropriately during drought are important. Fungicides treatments are not effective.

For more information see:

- <http://www.uri.edu/ce/factsheets/sheets/evergreenprob.html>
- <http://pubs.ext.vt.edu/430/430-026/430-026.html>
- <http://essmextension.tamu.edu/treecarekit/index.php/before-the-storm/tree-identification-and-selection/identification-of-and-corrective-action-for-poorly-drained-soils-in-the-landscape/>

## Rose Rosette Disease

Rose rosette disease has been spreading through invasive wild multiflora rose populations in Missouri for many years and is lethal to both multiflora rose and cultivated garden roses. Until recently, the cause of the disease was uncertain. A new virus has been identified in affected roses and named rose rosette virus (RRV). Because symptoms of RRV are variable and can mimic certain herbicide injury symptoms, testing

protocols have been developed for disease confirmation in valuable rose plantings. For more information on RRV:

- <http://www.pubs.ext.vt.edu/450/450-620/450-620.html>
- <http://arkansasagnews.uark.edu/6122.htm>

For testing information contact the Oklahoma State University Plant and Insect Diagnostic Clinic:

<http://entopl.okstate.edu/pddl/pddl>



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**Rose rosette virus symptoms.**

## Conifer Issues

*“Most affected conifers are non-native species, poorly adapted to Missouri soils and climate.”*

**Damage from environmental stress** is common across the state this spring. Symptoms include yellow or brown needles, needle drop, dead branches and complete tree death. Within plantings, a range of symptom development is often observed with some trees displaying no symptoms. Most affected conifers are non-native species, poorly adapted to Missouri soils and climate. Some trees that have grown well on a site for years have reached a maximum capacity for growth on the site, or have faced increasing competition with nearby trees for resources. For many conifers, last year's drought was the inciting factor for tree decline and death. Extended periods of excessive moisture during previous years in some locations were also stressful to these species.

Severely stressed conifers are attacked by insects and diseases that contribute to the death of the tree. Unfortunately,

there is not a lot that can be done after the fact. The damage is already done by the time you see symptoms. No fungicide or insecticide treatment will help these trees recover. For trees that are less severely affected, good tree care practices to reduce stress are important. Proper watering of high-value trees during drought is critical to reduce susceptibility to insects and disease. To prevent a build-up of insects that will attack healthy conifers, destroy dead and dying pines through chipping, burning, or burying.

In rare situations, insecticide applications may help protect healthy high value conifers located near conifers that have been attacked by bark beetles. Complete coverage of the entire healthy tree including the upper branches is required for applications to be effective. Applications to large trees require a tree care professional, are expensive, and may involve insecticide drift into un-

desirable locations. Additional bark beetle attack may not be a problem if sanitation measures are taken and proper watering is maintained.

We anticipate additional impacts to conifers from weather extremes even if more moderate weather prevails this year.

Additional information can be found at:

- <http://www.ppd.purdue.edu/PPDL/pubs/briefs/Conifer-Dieback.pdf>
- <http://www.barkbeetles.org/ips/ipsfidl.htm>
- <http://txforests.tamu.edu/main/popup.aspx?id=1241>
- <http://www.extension.org/pages/54361/techniques-for-treating-bark-beetle-in-forest-stands-individual-trees-and-firewood>

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**Eastern white pines in central Missouri after the 2012 drought.**



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# Conifer Issues *continued*

**Needle diseases can be confused with environmental stress.** We are getting few reports of fungal needle diseases this spring. However, some of these diseases may be present, and if extended periods of needle wetness continue this spring, new infections will become apparent later this year. When trying to determine if needle diseases are present consider these points:

⇒ **Identify the species.** Most needle diseases are specific to one or a few tree species only. Once you know the species, you can look up common needle diseases. Some species such as eastern white pine rarely develop needle diseases in Missouri even during a wet year.

⇒ **Look for damage patterns.** Trees that rapidly turn a uniform brown or have individual branches that turn a uniform brown are not displaying typical symptoms of needle diseases. Many needle diseases start in the tree interior or lower branches and gradually move up over multiple years. They may only affect older or younger needles depending on the disease.



USDA Forest Service, Bugwood.org

UGA1406191

**Rhizosphaera needle cast starts at the base of Colorado blue spruce and progresses up the tree.**

⇒ **Many needle diseases start off as bands or spots on the needles.** With a hand lens you may be able to see fungal structures on needles, however these are not always seen. If the damage pattern fits, consider sending a sample to a plant diagnostic lab for certain identification. Plant

diagnostic labs have the equipment and knowledge to provide a rapid, accurate diagnosis and management information. See [www.npdn.org](http://www.npdn.org) for contact information and fees for individual labs.

For more information on some of the most common conifer needle diseases see:

- <http://ohioline.osu.edu/hyg-fact/3000/3059.html>
- <http://web.aces.uiuc.edu/vista/pdf/pubs/624.PDF>



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**Bands and spots on Austrian pine needles with Dothistroma needle blight.**

## Boxwood Blight

Boxwood blight causes leaf spots, blight, girdling cankers and extensive dieback, weakening the plant. While it has not been detected in Missouri, it has been reported from 10 eastern states and Oregon. The disease is transported on infected plants, plant material, contaminated tools and equipment and is difficult to eradicate once established, making awareness of the disease important.



P.W. Trenchard, Connecticut Agricultural Research Station

**Severe boxwood blight infection.**

For more information see:

- [http://www.ct.gov/caes/lib/caes/documents/special\\_features/boxwood\\_blight/update\\_on\\_boxwood\\_blight\\_11-13-12.pdf](http://www.ct.gov/caes/lib/caes/documents/special_features/boxwood_blight/update_on_boxwood_blight_11-13-12.pdf)
- [http://www.ppws.vt.edu/~clinic/alerts/11-04-11\\_boxwood\\_blight\\_alert.pdf](http://www.ppws.vt.edu/~clinic/alerts/11-04-11_boxwood_blight_alert.pdf)

**“...many negative impacts from the 2011 and 2012 droughts are expected during the next several years.”**

## Drought Impacts Still Expected

Despite improvements in moisture levels this winter and spring, many negative impacts from the 2011 and 2012 droughts are expected during the next several years. The initial damage has already been done. Trees are still stressed. During severe drought, some root death occurs, further reducing water absorption and wind firmness

of trees. Physiological and chemical changes in drought-stressed trees reduce their ability to defend against insects and diseases. Bark beetles and wood boring insects can detect and are attracted to drought-stressed trees. Many trees may be harboring insects and diseases whose impacts will not be fully visible until later this year or the next few

years. As trees decline, they can serve as reservoirs of pest populations that can build and spread to other stressed trees. Urban trees can be further stressed by many other factors that add to the pace of decline (wrong site for that tree species, injury from lawn equipment, poor pruning, construction or digging activities, etc).



**Flatheaded appletree borer adult**



**Red oak borer adult**

## Hardwood Borers & Drought

Wood borer and bark beetle activity is expected to be much more common on many kinds of trees this summer. When borers are found on declining trees, they are often blamed as the cause. But in most cases, borers are secondary agents attacking trees that are already stressed by drought or other factors. A significant amount of borer damage that we will see a few years from now will likely be related to the droughts of 2011 and 2012. Signs and symptoms of borer attacks include branch dieback, reduced shoot growth, exit holes, tunneling under the bark, and frass (excrement and wood/bark particles).

One of the more common borers causing damage on hardwoods in urban settings is the flatheaded appletree borer. It is especially common on maples that are recently planted, drought-stressed, or have frost cracks or other wounds. Damage often is not noticed until late summer or early fall when holes appear in the bark. They are not borer exit holes, but rather are made by woodpeckers that detect the larger borer larvae present at that time of year. Flat-headed appletree borers actually invade trees in spring when the adult female deposits its eggs in old wounds and bark crevices.

Young larvae then emerge and tunnel beneath the bark. More information:

- <http://hyg.ipm.illinois.edu/article.php?id=301>
- <http://www.ipm.iastate.edu/ipm/info/insects/beetles/flatheaded-borers>

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**Red maple damaged by flatheaded appletree borers and woodpeckers.**



# Hardwood Borers & Drought *continued*

Many other borers frequently affect hardwoods in Missouri, including other flatheaded borers (twolined chestnut borer on oaks and bronze birch borer on birch), roundheaded borers (red oak borer and many others), bark beetles (on hickory, elm, oak and ash), ambrosia beetles (native and exotic species on walnut, oaks, maple and others) and moth caterpillars (carpenterworms on oaks and various clearwing moths on ash, oak and fruit trees) ... just to name a few.

- <http://ianrpubs.unl.edu/live/ec1580/build/ec1580.pdf>
- <http://www.ksre.ksu.edu/bookstore/pubs/mf2735.pdf>



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**Brown, papery pupal case (exoskeleton) protruding from a hole in bark indicates a moth type of borer has emerged.**

The primary recommendation for drought-stressed trees and trees with borer attacks is to avoid additional stress. Provide water during new drought events, especially for recently planted trees, and avoid unnecessary wounding. Timely removal and destruction of dying branches or trees can be helpful in reducing pest populations that can attack remaining trees.



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**Frass (granular insect excrement) in bark crevices indicates beetle or moth borers are present. But no frass is ejected by flatheaded borers.**

Insecticides are not effective on borers that are already within the tree, but in some cases may protect against new attacks. Deciding when insecticide use is appropriate can be difficult. The borer's identity is unknown in many cases. The impact of some borers may be limited (some roundheaded and clearwing borers) because only a few attacks and negligible damage occur per tree, or because the tree is declining due to other causes and borers are secondary concerns. No insecticide use is warranted in those cases.

Systemic insecticides such as imidacloprid and dinotefuran often seem like a good way to protect against borers. They're applied with various techniques to soil or tree stem and are then translocated throughout the tree. But they are not appropriate in many situations. These materials are most effective against flatheaded borers, but are not effective against ambrosia beetles and moth caterpillars and have only limited effectiveness against most bark beetles. Even when protecting a host tree against a known susceptible borer, there can be other limiting factors. Systemic insecticides need to be applied up to several weeks prior to borer attack. Trees are not able to translocate systemic insecticides during severe drought condi-

tions. Trees that have been heavily damaged by past borer attacks or with wounds, sunscald or mechanical damage on a large portion of the stem will have limited ability to move systemic insecticides to where they're needed. Imidacloprid and dinotefuran should not be applied on or near blooming trees and shrubs due to impacts on pollinators.

Pyrethroids, such as permethrin and bifenthrin, are non-systemic insecticides that are sprayed on the bark surface to control borers as they enter the tree. Knowing a borer's identity and life cycle is important to appropriately time all insecticide applications, but it's especially critical with topical applications of non-systemic insecticides. Multiple applications may be required to maintain control throughout the window of time when borers attack.

Always follow directions on pesticide labels. If treating multiple trees, note that some insecticides such as imidacloprid and dinotefuran have a maximum amount of material that is allowed to be applied per acre per year.



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**Shredded wood slivers in bark crevices indicate some type of longhorned beetle is present.**



# Widespread Hypoxylon Canker

We have received many reports of Hypoxylon canker on various oak species in the past couple years. Extensive canker development has occurred state-wide since last summer on both red and white oak species. Hypoxylon canker is a contributing factor to oak decline and is an indication of cumulative tree stress, rather than an aggressive tree killing pathogen at work. See the Forest Health Alert at:

[http://mdc.mo.gov/sites/default/files/resources/2013/02/fhalert\\_hypoxylon\\_2013.pdf](http://mdc.mo.gov/sites/default/files/resources/2013/02/fhalert_hypoxylon_2013.pdf)

Black zone lines appear in the sapwood as rapid decay occurs, leaving the tree in a very brittle state. ⇒



Randy Cyr, Greentree, Bugwood.org

UGA1238016



H.A. Pase III, Texas A&M Forest Service

## Oak Wilt Update

Remember the rule for oaks, "Don't prune mid-March to June". However, this year a late spring means the risk of oak wilt infection didn't go up until April. For more information on oak wilt, see the Forest Health Alert at:

[http://mdc.mo.gov/sites/default/files/resources/2013/04/fhalert\\_oak\\_wilt\\_2013.pdf](http://mdc.mo.gov/sites/default/files/resources/2013/04/fhalert_oak_wilt_2013.pdf)



Joseph Obrien, USDA Forest Service, Bugwood.org

UGA5039064

Browning, wilting and leaf drop in early summer.



C.E. Seliskar, Bugwood.org

UGA1949013

Leaf scorch progressing from margins.



R. Bassett, USDA Forest Service, Bugwood.org

UGA1501034

Streaking under bark is common on infected trees.

**Questions?** Contact your local Resource Forester or Urban Forester with the Missouri Department of Conservation.

Find contact information for your county at:

[www.mdc.mo.gov](http://www.mdc.mo.gov)

Photo Credits from page 6, flatheaded appletree borer and red oak borer: Natasha Wright, Florida Department of Agriculture and Consumer Services, Bugwood.org.